A multi-disciplinary approach to manage longevity risk

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IAA Mortality Working Group Seminar

Zurich

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Longevity risk management overview

Before acquiring business	After acquiring business
Diversified annuity business model Different types of annuities Diversify with other risks	**Capital** Sophisticated modelling to ensure sufficient and efficient capital.
Pricing appropriately for risk for each business Market-leading knowledge, skills and models.	**Actively managing longevity risks** Expertise to avoid disproportionate volatility.

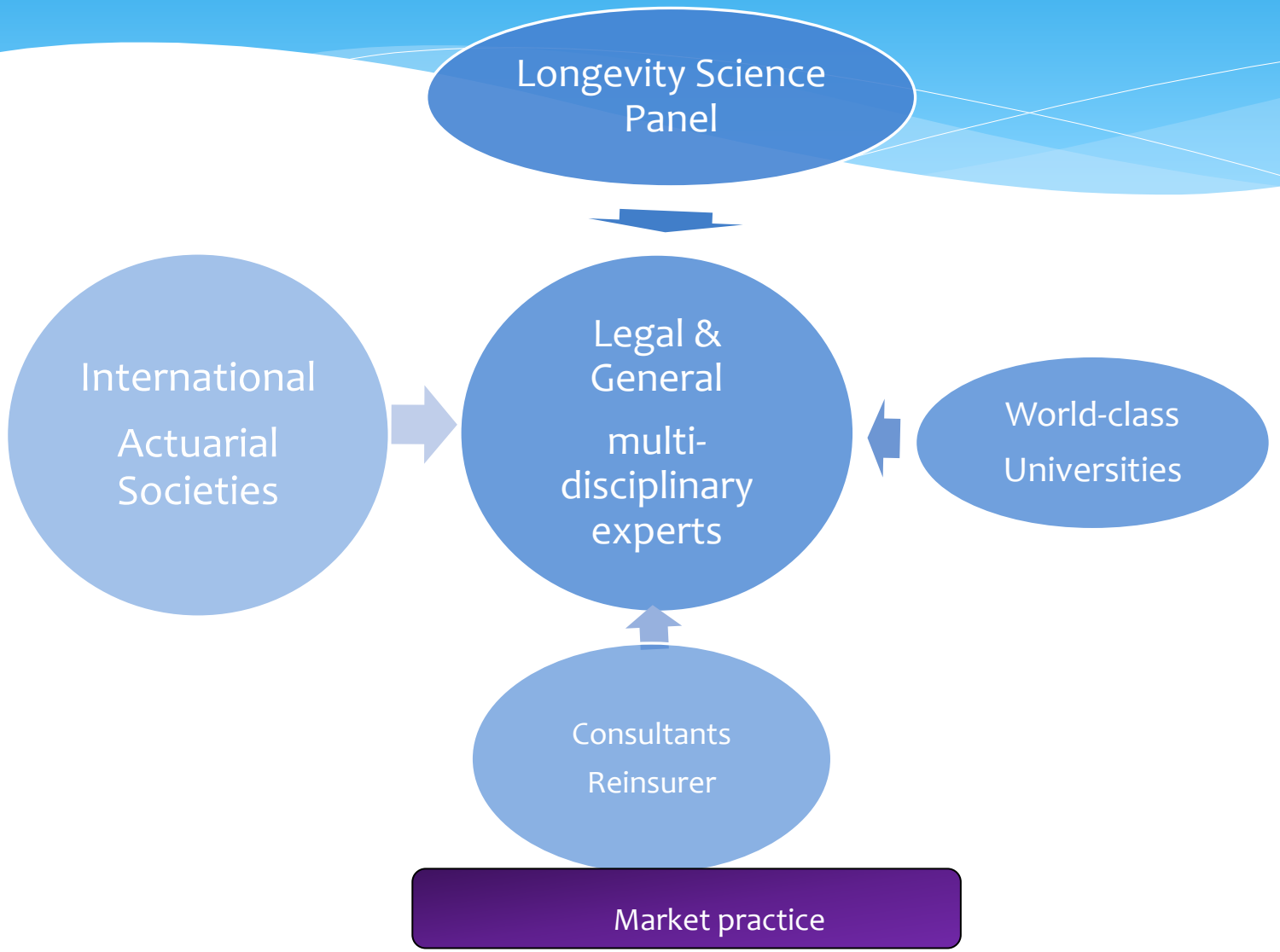
Hedging and Reinsurance

Competitive reinsurance market

Liquid longevity market?

Longevity Risk Expertise

We have developed a credible network of expertise which informs our management of longevity risk



Multidisciplinary Longevity Science Panel

Dame Karen Dunnell
Former UK National Statistician

Sir John Pattison
Former Department of Health's R&D Head

Sir Colin Blakemore
Former Medical Research Council's CEO

Professor Klim McPherson
National Heart Forum's Chair

Professor Steve Haberman
Cass Business School's Dean

Discuss opportunities & challenges

Base Mortality

* Rating factors for Bulk Buyout, Buy-in & Longevity Swaps
* Potential imprecision
* Scope for more granularity

Future Trend

* Drivers for future tends
* Socio-economic circumstances
* Risk Factors
* Medical Developments
* Role of data, modelling & expert views

UK Bulk Buyout

Year	2005-2009	2010-2014	2015-2019	2020+
Rating Factors	Postcode, Pension	Medical Underwriting, etc	Discuss	Discuss

In addition to age, gender.

Postcode: Potential Imprecision

LU5 6PP

	Very Affluent (Lowest mortality)	Average	Very deprived (Highest mortality)
Model X	X		
Model Y			X

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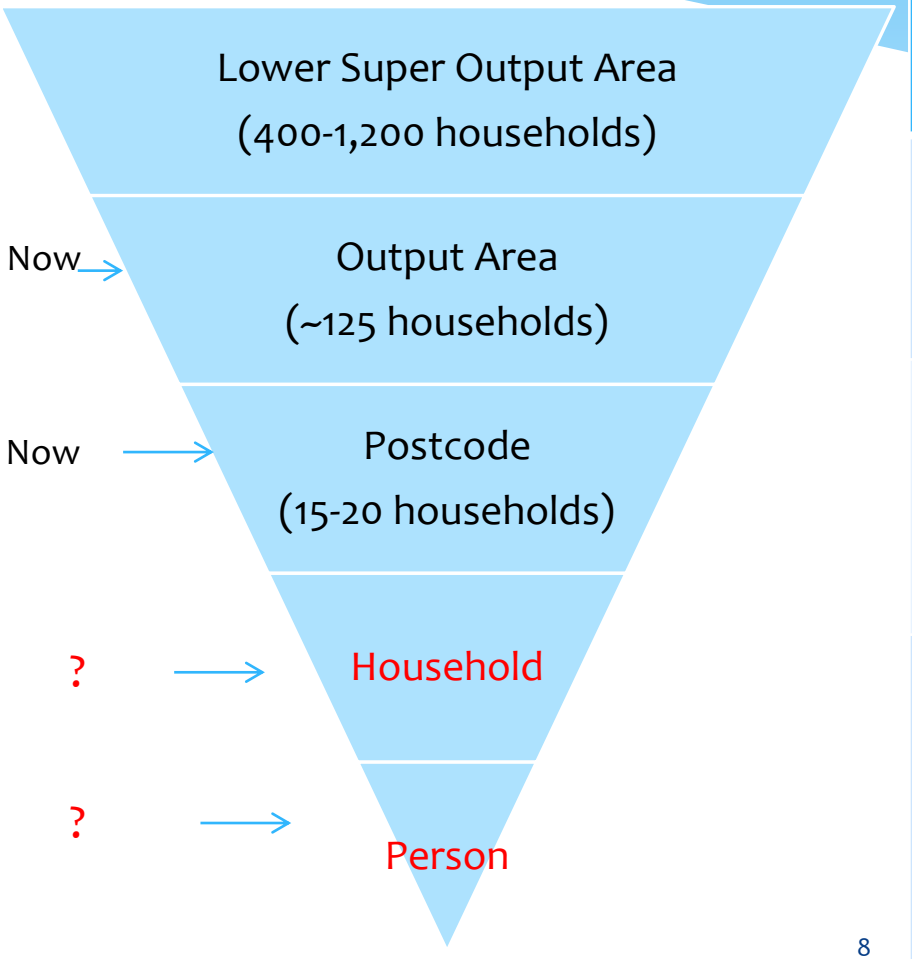
	Very Affluent (Lowest mortality)	Average	Very deprived (Highest mortality)
Model X		X	
Model Y	X		

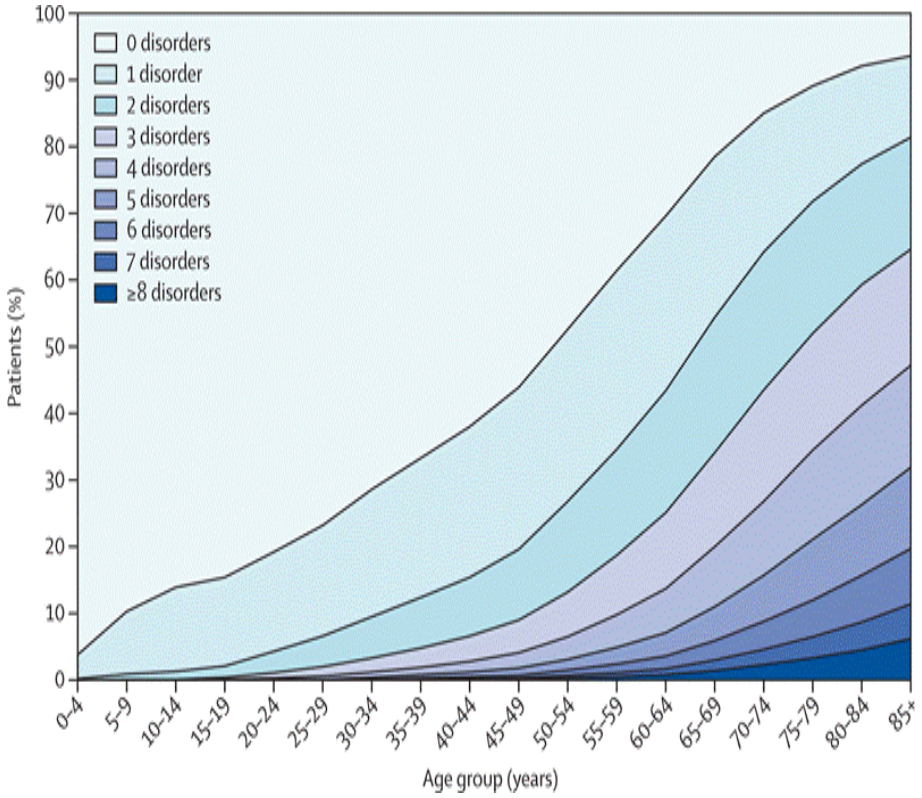
Opportunity - Granularity



Possible household information based on modelling or data
Wealth House type (bungalow, social renting) Home value Income
Lifestyle Weekly spending in supermarket Hobby (golf, walking, etc.) Pets. Holiday frequency, location, spending.
Financial sophistication Savings Investment value Loan Financial products: Medical cover, insurance, pension schemes

Wider field - multimorbidity

Multimorbidity

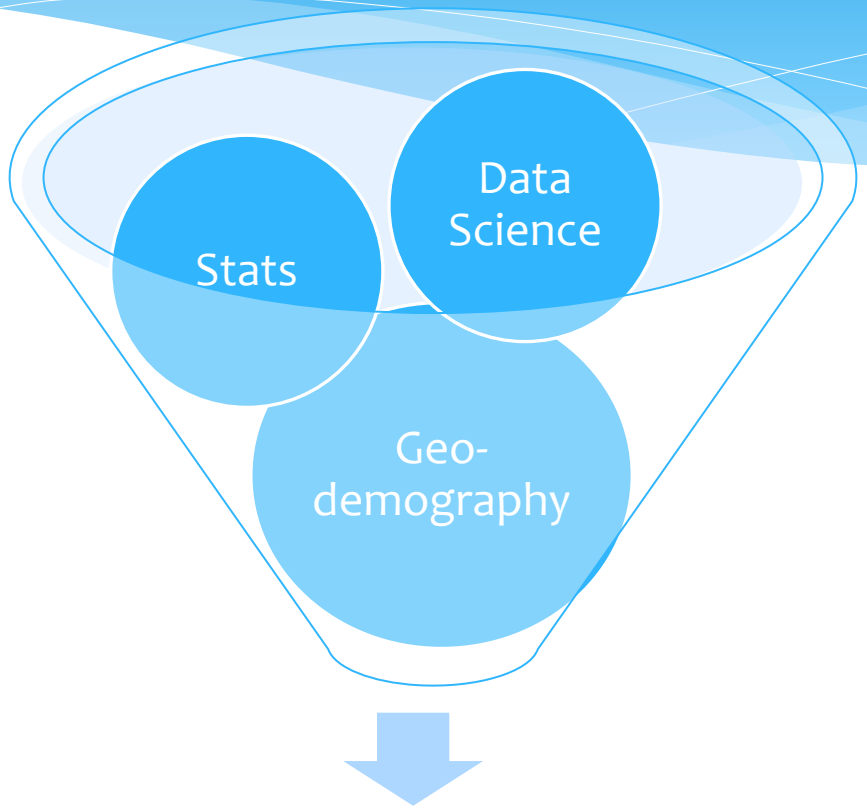


Source: Karen Barnett et al, Epidemiology of Multimorbidity, Lancet, 2012

Relevance

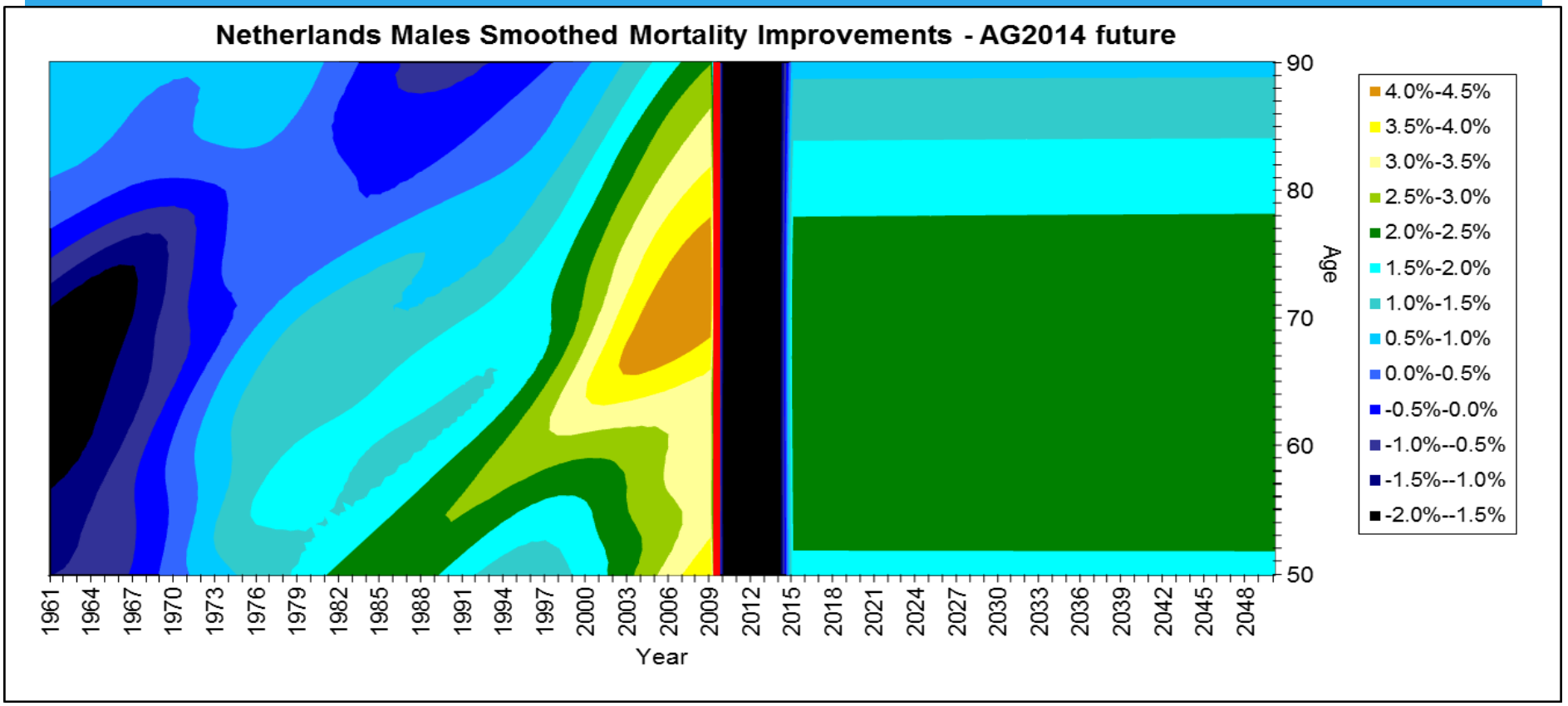
- About 2 in 3 age 70-74 have more than 1 disorder
- Relevant to:
  - Individual annuity
  - Secondary annuity
  - Forecasting
- Wider field
  - Lifetime mortgage (equity release) older customers' mortality & morbidity
  - Retirement homes

Multidisciplinary opportunity



Predictive Analytics

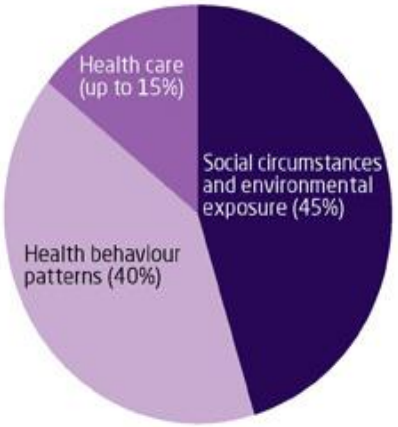
Future Trend Issues?



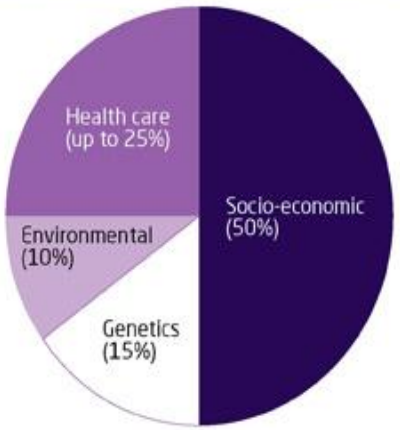
2000-2014	2015-2019	2020+
Cohort	?	?

Future Trend: Identify and categorise forward-looking risk drivers

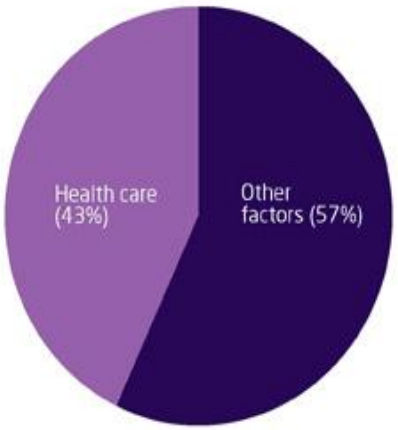
Mc Giniss et al (2002)



Canadian Institute of Advanced Research (2012)



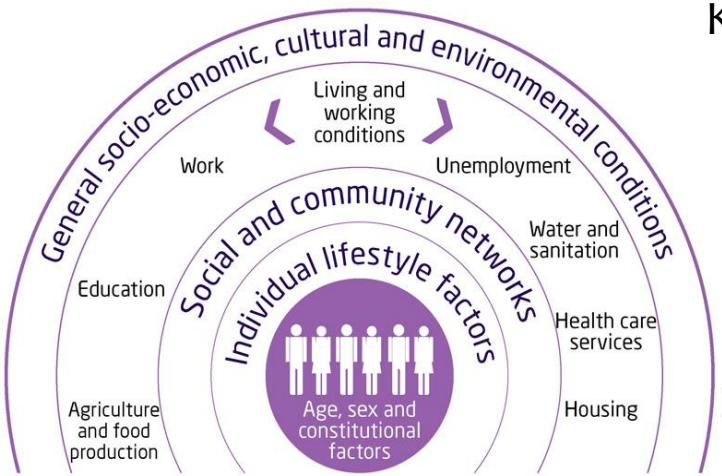
Bunker et al (1995)



Longevity Drivers:
Socio-economy
Biology
Health care system
Medical advancement
Environment

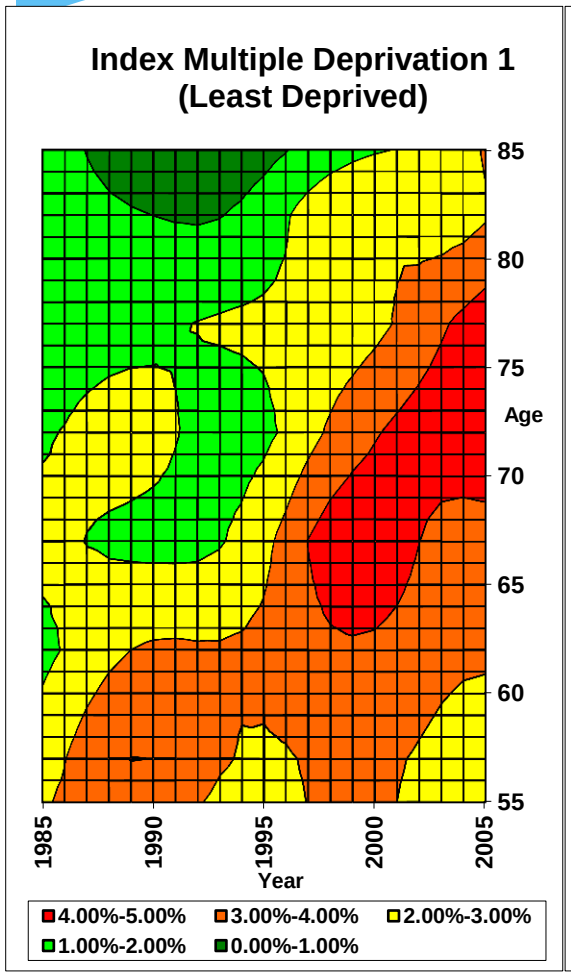
Kings Fund

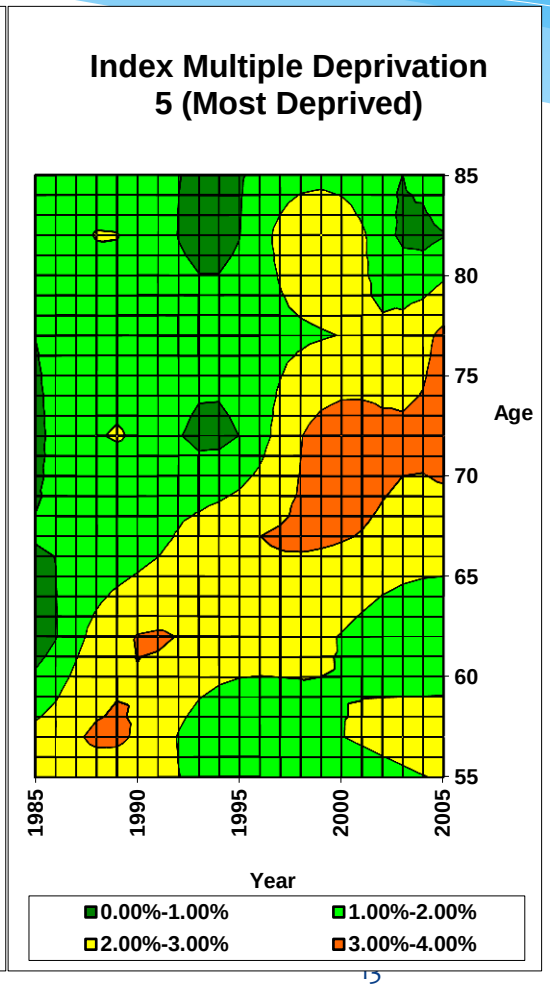
Longevity Understanding:
Data
Technique
Insight



Dahlgren et al (1991)

Mortality improvement of people in different socio-economic circumstances UK Debate. What about other countries?





- Our work suggests that rich-poor mortality gap has widened 1980-2005. (BAJ, 2013)
- Club Vita's work on DB pensioners suggests rich-poor gap has narrowed 2000-2010. (NAPF Longevity Model, 2014)
- Debate continues:
  - Comparing different period
  - Different population
  - Different classification method
  - Club Vita population changed during investigation period?

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Health care system

(The Academy of Medical Sciences 2014 - Horizon scanning: looking ahead to 2025)

Falling number of approved drugs per unit investment.

Industry moving away from blockbuster drugs.

Moving into more targeted medicines.

Each treatment may deal with smaller number of people.

Overall, it might need longer time horizon to cover larger scope of diseases.

NHS funding freeze since 2011, despite rising demand with new problems presented by ageing population and co-morbidity.

NHS funding gap expected to be £30bn by 2020.

Social care cost is rising with ageing population.

Academics urged to be multi-disciplinary, improving innovation.

Academic funding for behavioural sciences research, with public behaviour contributing to 50% diseases but attracting only 1% of funding.

Industry move towards individualised diagnoses and treatments.

Technology, e.g. wearable, to monitor health and drug uptake.

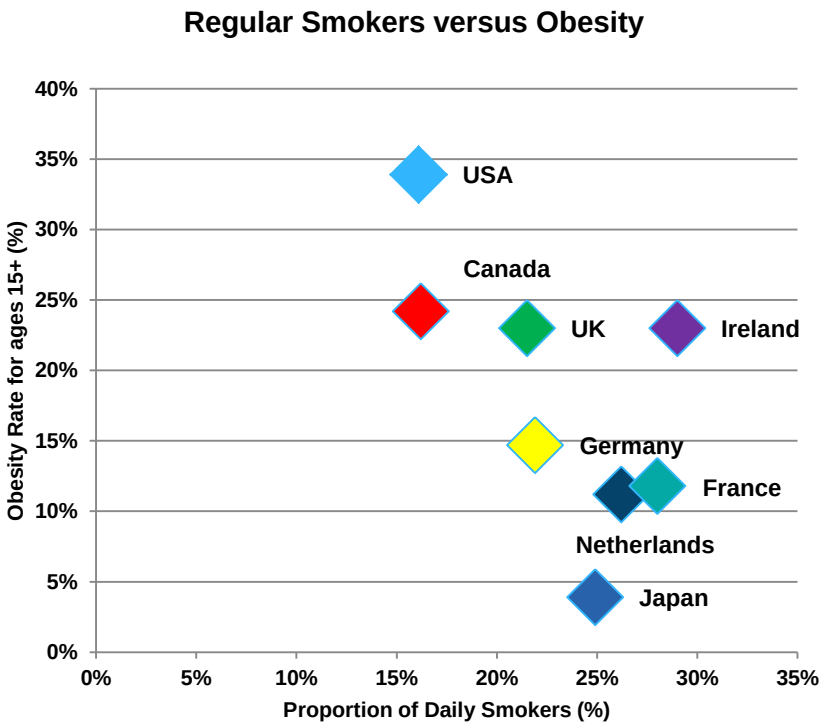
Big data to help cost-cutting and treatment effectiveness.

Cheaper drugs following globalisation with manufacturing in lower cost environment.

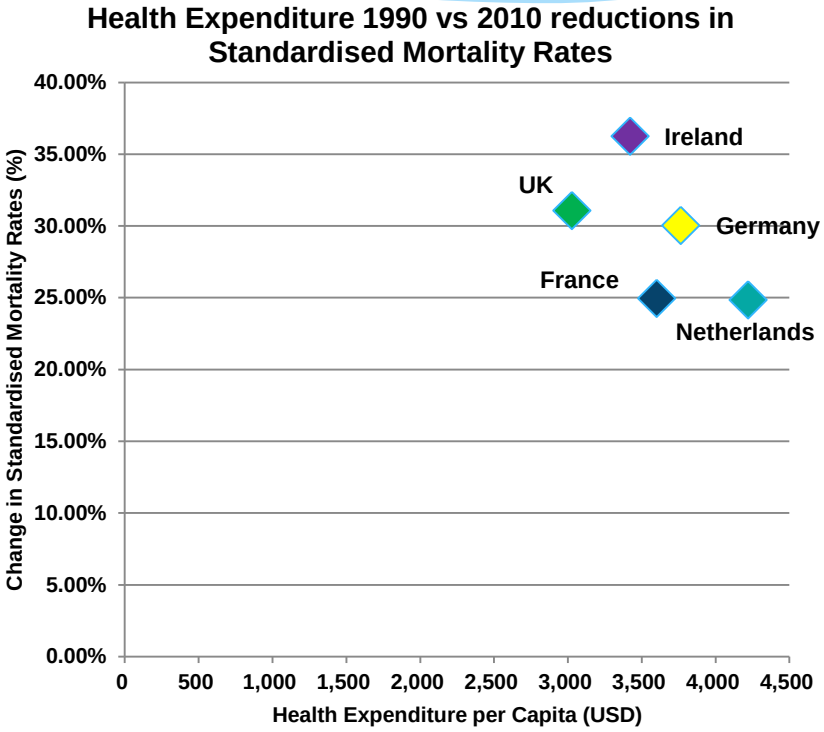
International differences:

Future trends could benefit from modelling

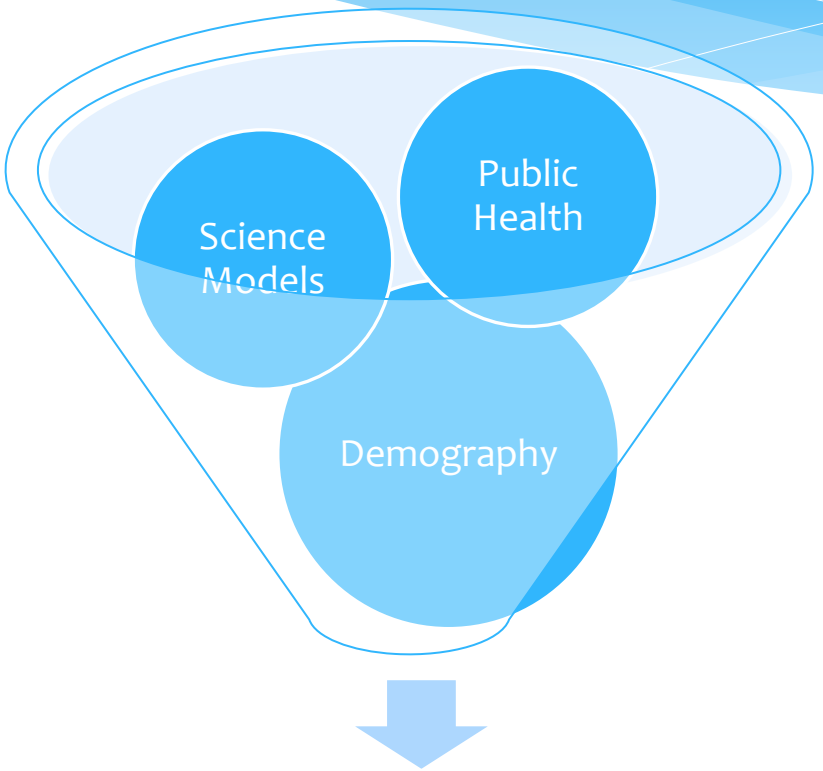
Risk factors



Expenditure vs. Mortality



Multi-disciplinary opportunity



Explanatory models

Longevity Science Panel Case Study

Opinion Survey: To understand recent advances in the biology of ageing and their potential to delay the process of ageing

Biology of Ageing Experts:

* Professor Richard Faragher
* Professor David Gems
* Professor Tom Kirkwood
* Professor Janet Lord
* Dr João Pedro De Magalhaes
* Professor John Mathers
* Professor Dame Linda Partridge
* Professor Eline Slagboom

www.longevitypanel.co.uk/biology-ageing

State of Science:
Ageing is a complex process

Theories of Ageing

- Mutation accumulation
- Antagonistic Pleiotropy
- Disposable Soma

* 3 theories but in due course an overall theory may incorporate elements of each.

Mechanisms of Ageing

- Cell turnover & senescence
- Telomere shortening
- Oxidative stress
- Mitogen activated protein kinases
- Nutrient sensing

"The fun thing about ageing is that it does touch on every aspect of life – and yet it takes you into some of the hardest science on the planet because the ageing process is so extremely complicated"

Research issues:

Ageing & Diseases

- Lifespan vs Healthspan
- Multi-morbidity
- Frailty

Animal models

- Useful - Similarity in most animal species, so results could be interpreted for humans.
- Genetic manipulation adds insights
- But with limitations - Unique processes for humans

"I would be very, very happy if the long-term goal of the research I did improved healthspan greatly but didn't improve lifespan by a single day"

Interventions to delay the ageing process
Existing Drugs

- Rapamycin - Stops immune system from rejecting transplanted organ
  - Anti-cancer
- Resveratrol - Antioxidant in red wine
- Statins - Lower cholesterol levels
- DHEA - Food supplement steroid hormone

"You can treat middle-aged mice with Rapamycin and see benefits in terms of extending lifespan."

"Statins are going to have a big impact."

"If they were giving the polypill to everybody from 50, you'd see an increase in lifespan. And to my mind that's an anti-ageing intervention".

"I don't think there'll be a pill where people are going to double their lifespan."

Interventions to delay the ageing process: Behavioural & new developments

Behaviour changes

- Exercise
- Diet & nutrition
- Mediterranean diet
- Caloric restriction
- **But compliance is an issue**

New developments

- Regenerative medicine
- P38 MAPK inhibitors

"I don't think there is anything that an individual can do to retard the process of ageing other than exercise."

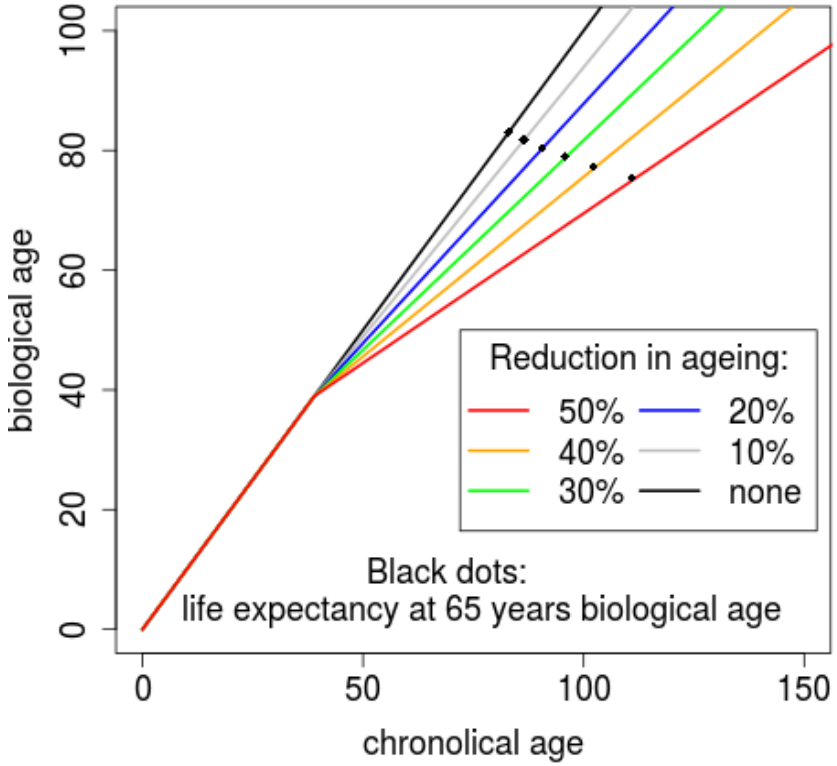
The Future

- A ‘Wonder Pill’ for anti-ageing not in sight.
- Life expectancy would continue to rise in the next decade but not as fast as has been seen in recent decades.
- What happens beyond 10 years will depend on advances in the basic and applied sciences relevant to ageing.

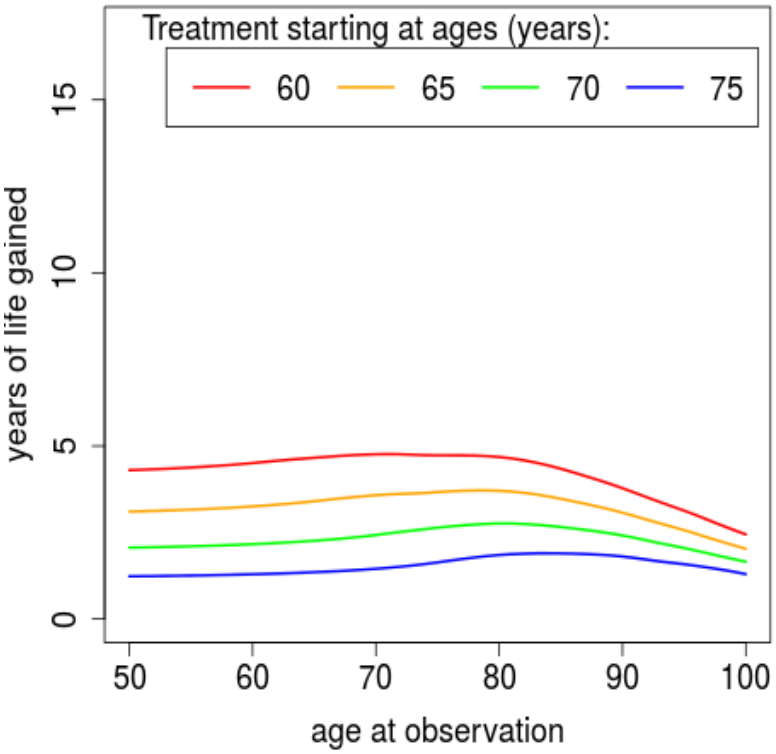
“The UK population’s life expectancy could be more effectively improved through simpler measures such as exercise, good nutrition and better use of existing treatments, rather than waiting for a dramatic anti-ageing breakthrough.” ***LSP October 2014***

Examples of modelling

Effect of reduction in ageing



Effect of 25% reduction in ageing rate



Conclusion

- **Challenges for Bulk Annuities Base Mortality underwriting**
  - Granularity
  - Individual health status
  - Scheme information
- **Opportunities for multi-disciplinary approach**
  - Data sciences, geo-demography, statistics, etc.

- **Challenges for Future Trend**
  - Socio-economic circumstances
  - Important to understand drivers for longevity to forecast future trends.
  - Some insights can be used in the short term.

- **Opportunities for multi-disciplinary approach**
  - Public health, medical modelling, statisticians
  - Pharmaceuticals, medical scientists